PV System Review and Evaluation:

A Consumer Awareness View of Available Systems

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Commonwealth Biogas/PV Mini-Grid Renewable Resources RD&D Program

- Resource Assessment (Project 1.1)
- Landfill Bioreactor (Project 2.1)
- Sewage Wastewater Digestion (Project 2.2)
- Animal Manure Digestion (Project 3.1)
- Building Integrated PV (Project 3.2 and 3.3).







Project 3.2 Building Integrated PV Testing and Evaluation Project Goals

- Address the gap between future third-party certified PV component and system performance results and currently available information from manufacturers
- Provide an independent comparative evaluation of PV systems critical to Project 3.3 and to the Commission Buydown Program
- Provide decision-making information on those PV systems: detailed system performance data and "Consumer Reports" style evaluation.
- Improve the quality of systems installed in Project 3.3 through directed training







Project 3.2 Objectives

- Select, procure, install, and evaluate three Commercial Scale candidate PV Systems for implementing Project
 3.3 BIPV on Public Buildings
- Evaluate selection, ease of installation, performance, other issues that may impact life-cycle costs
- Determine flaws, weak points, poor design features, etc. and offer suggested fixes
- Monitor and report on system performance for 12 months
- Develop recommendations for system purchases.
- Duplicate the process for three Residential Scale systems







Project 3.2 Building Integrated PV Testing and Evaluation Project

- Large System Evaluation
 - Three 20-kW Commercial-type PV Systems
- Small System Evaluation
 - Three 3-kW Residential PV Systems
- Tech Transfer
 - Web Page
 - Technical Papers/Presentations
 - Workshops



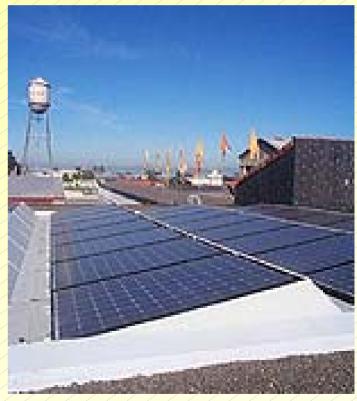




System #1: 20kW Sloped PowerGuard by PowerLight Corporation

- Newly released PIER-funded product
- Using the latest 190-Watt Sanyo
 Hybrid a-Si/c-Si Technology
- Non-penetrating
- Lightweight (4 lb/ft²)
- · 10° tilt
- Xantrex Inverter



















System #2: 20kW SunRoof FS by Schott Applied Power Corporation

- Newly released, PIER-funded FS (Free Standing) product

ASE Edge-defined Film-fed Growth
 Technology

- Non-penetrating Mount
- Lightweight (3-6 lb/ft²)
- 5° tilt
- Xantrex Inverter











RWE Schott Solar Sunroof FS Install





System #3: 20kW Multi-String System

- Mounted on freestanding mounting system
- 10 individual 2 kW_{ac} PV strings
- Details of systems selected by TAC
 - 9 PV technologies represented
 - 9 manufacturers
 - 2 Uni-Solar Arrays: (1) Framed modules on racks; and, (2)
 flexible laminates adhered directly to roof.
 - Thin films: triple junction a-Si, CIS, and CdTe
 - Crystalline: mc-Si, pc-Si, pc-Si film, and SR-c-Si (String-Ribbon Crystal film), Edge-defined Film-fed Growth, mc-Si with a-Si top layer
- Uses SMA Sunnyboy for consistency, data logging













Solar Integrated Technologies with UniSolar Laminates









Six 2kW Arrays with Identical Mounts and Inverters

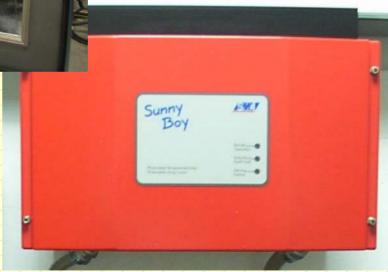
- AstroPower AP-110
- BP Solar SX-140
- Evergreen EC-102
- SAPC-123 (Sharp)
- Shell Solar SP-140
- Shell Solar ST-40 (CIS)





Sandia Test Support











Detailed Inverter Performance Evaluation

- Inverter + Modules = System Performance
- Need 3rd party standardized evaluation
- PowerMark, ASU/PTL, FSEC, ESTI commercially instituting module performance evaluation
- Sandia developing inverter performance evaluation, but no commercial testing yet







Large System Evaluation Summary

System	Documentation	Shipping	Mounting	Installation	Performance	Cost
PowerLight						
RWE FS						
SIT						
First Solar						
IES US-116						
IES APx-130						
AP-110						
BP SX-140						
EC-102						
SAPC-123						
Shell SP-140						
Shell ST-40						







Small System Evaluation



Small System Eval: Potential Systems

- AstroPower
 - SunUPS
- Kyocera
 - MyGen
- Schott APC
 - SunRoof RS
- Sharp Solar







Is this needed or wanted?

- Consumers want more information from sources they feel they can trust.
- Consumers don't know the information they want.
- Focusing attention on key system parameters helps the consumer better understand what to look for and help manufacturers identify areas they want to improve.







What defines success?

- Success of the project will be based on several factors
 - Quality of the information
 - Use of information by consumers and installers
 - Support from PV industry: "We need this"
 - Participation of CEC and other project members.
 - Improvements and product changes in response to project evaluations







Where to find information about the project...

www.pierminigrid.org

www.endecon.com

Stay Tuned...





